REMARKS

Claims 1-13 are pending in this application.

Claims 1-13 are rejected.

The office action dated Sept. 24, 2008 indicates that claims 1-4 and 6-13 are rejected under 35 USC §103(a) as being unpatentable over Yokel U.S. Patent No. 3,803,934 in view of Rediker US Patent No. 5,323,665 and McCaw U.S. Patent No. 4,244,243.

Claims 1-6 and 11-13 have been cancelled, and claim 7 has been amended for clarity. Amended claim 7 recites a machine comprising:

a first shaft;

a spur gear mounted to the first shaft;

a second shaft, the first and second shafts having an angular variance greater than zero degrees; and

a low angle face gear including a hub mounted to the second shaft, an angled gear flange surrounding the hub, and a plurality of gear teeth on the gear flange, the low angle face gear in mesh with the spur gear,

wherein a first vector normal to an outside surface of the angular flange and a second vector normal to the second shaft form an angle that is equal to the angular variance of the first and second shafts.

The machine of claim 7 is not taught or suggested by the documents made of record. Yokel discloses a transmission that transmits power to an inclined propeller shaft 4. The transmission includes a bevel gear 18 that is journaled on an input shaft 10. The bevel gear 18 is of the tapered helical type, having a front end of smaller diameter [than its back end] (column 3, lines 57+).

The transmission further includes an output shaft 40, which is inclined at approximately 7 degrees of horizontal. A large tapered helical gear 44 on the output shaft 40 is in constant mesh with the bevel gear 18 (column 3, lines 26+).

Thus, Yokel proposes two tapered helical gears that are in constant mesh. However, the use of helical gears on the non-parallel shafts 10 and 40 can be

undesirable. The background of the present application provides some reasons as to why Yokel's transmission is undesirable.

The applicant overcomes the type of problems associated with Yokel's transmission. By angling the gear flange at the angle recited in amended claim 7, the face gear can achieve line contact with a spur gear. In contrast, Yokel's helical gears 18 and 44 achieve point contact.

Yokel does not teach or suggest the face gear recited in amended claim 7. The office action alleges that Yokel's element 44 is such a gear. However, Yokel doesn't support the allegation. Yokel describes element 44 as a large tapered helical gear 44 (column 3, lines 26+). Yokel does not teach or suggest that gear 44 is a ***face*** gear.

The office action also alleges that element 18 is a spur gear. However, Yokel doesn't support the allegation. Yokel describes element 18 as a bevel gear 18 of the tapered helical type (column 3, lines 57+).

The other documents do not identify a problem with Yokel's transmission, nor do they teach or suggest replacing meshed gears 18 and 44 with a spur gear and the low angle face gear of claim 7. Rediker discloses a flywheel 40 having a flat outer annulus 42 and a steel ring gear 53 is welded to a radial outer edge of the annulus 42. McCaw also discloses the use of bevel gears, whose tooth-bearing faces are conically shaped.

Thus, the combined teachings of the cited documents do not produce a machine having all of the features recited in amended claim 7. Therefore, amended claim 7 and its dependent claims 8-10 and new claim 14 should be allowed over the cited documents.

A telephonic interview was held on January 26, 2009, during which the undersigned and Examiner Terrence Boes discussed the '103 rejection. During the interview, it was pointed out that the background of the application describes a problem with a gear arrangement that is similar to Yokel's, and that the claims recite a machine that avoids that problem. It was also pointed out that that Yokel's gear 44 is not a face gear as recited in claim 7.

It was further pointed out that the Yokel's gear 18 is not a spur gear. Examiner Boes indicated that the specification doesn't describe the spur gear, and it could be broadly interpreted to cover Yokel's gear 18. However, we respectfully disagree. A spur gear is a term of art. See, for instance, the web page at

http://www.engineersedge.com/gears/gear_types.htm.

This web page describes spur gears, helical gears and face gears. A copy of the web page is attached as appendix A.

Examiner Boes is thanked for his comments during the interview. He is also thanked for granting the interview on short notice.

Claims 15-16 are also new. New claims 15-16 should be allowed over the cited documents for the reasons above.

Claim 15 recites line contact. The office action raises an objection to claims that recite "line contact" because line contact is allegedly not illustrated in the drawings. We respectfully disagree. Line contact is shown by the face and spur gears 20 and 62 described the specification and illustrated in Figure 5.

The Examiner is strongly encouraged to contact the undersigned to resolve any remaining issues prior to mailing another office action.

Respectfully submitted,

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Date: Jan. 26, 2009

APPENDIX A

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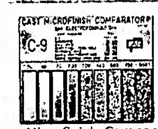

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Gear Types, Spur, Helical, Bevel, Rack and Pinion, Worm

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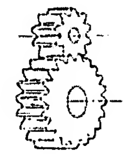
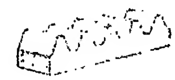
Spur Gears:



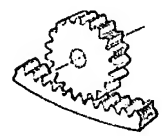
Spur gears are the most common type used. Tooth contact is primarily rolling, with sliding occurring during engagement and disengagement. Some noise is normal, but it may become objectionable at high speeds.

Rack and Pinion.



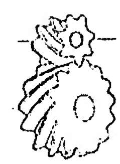
Rack and pinion gears are essentially a linear shaped variation of spur gears The spur rack is a portion of a spur gear with an infinite radius.

Internal Ring Gear:



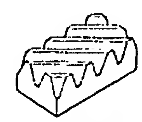
Internal gear is a cylindrical shaped gear with the meshing teeth inside or outside a circular ring. Often used with a spur gear. Internal ring gears may be used within a planetary gear arrangement.

Helical Gear:



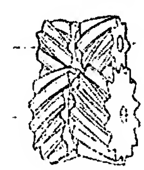
Helical gear is a cylindrical shaped gear with helicoid teeth. Helical gears operate with less noise and vibration than spur gears. At any time, the load on helical gears is distributed over several teeth, resulting in reduced wear. Due to their angular cut, teeth meshing results in thrust loads along the gear shaft. This action requires thrust bearings to absorb the thrust load and maintain gear alignment. They are widely used in industry. A negative is the axial thrust force the helix form causes.

Helical Rack Gear:



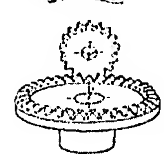
Helical rack gears are linear shaped and meshes with a rotating helical gear.

Double Helical Gear:



Double helical gear may have both left-hand and right-hand helical teeth. The double helical form is used to balance the thrust forces and provide additional gear shear area.

Face Gear:



Face gears are a circular disc with a ring of teeth cut on one side. The gear teeth are tapered toward the center of the tooth. These gears typically mate with a spur gear.

Worm Gear:

Worm gears teeth resembles ACME screw thread which mates with a helical gear, except that it is made to envelope the worm as seen along the worm's axis. Operation of worm gears is analogous to a screw. The relative motion between these gears is sliding rather than rolling. The uniform distribution of tooth pressures on these gears enables use of metals with inherently low coefficients of friction such as bronze wheel gears with hardened steel worm gears. These gears rely on full fluid film lubrication and require heavy oil compounded to enhance lubricity and film strength to prevent metal contact.

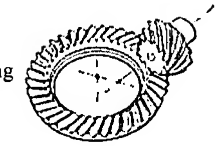
Double Enveloping Worm Gear:

The double enveloping worm gear has a radial changing pitch diameter. This increases

the number and amount of tooth shear area.

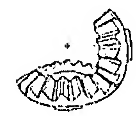
Hypoid Gear:

Hypoid gears are typically found within the differential (rear axle) of automobiles. The gear arrangement allows the translation of torque ninety degrees. Hypoid gears are similar to spiral bevel gears except that the shaft center lines do not intersect. Hypoid gears combine the rolling action and high tooth pressure of spiral bevels with the sliding action of worm gears. This combination and the all-steel construction of the drive and driven gear result in a gear set with special lubrication requirements, including oiliness and anti-weld additives to withstand the high tooth pressures and high rubbing speeds.



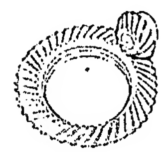
Straight Bevel Gear:

Straight bevel gears have tapered conical teeth which intersect the same tooth geometry. Bevel gears are used to transmit motion between shafts with intersecting center lines. The intersecting angle is normally 90 deg but may be as high as 180 deg. When the mating gears are equal in size and the shafts are positioned at 90 degrees to each other, they are referred to as miter gears. The teeth of bevel gears can also be cut in a curved manner to produce spiral bevel gears, which produce smoother and quieter operation than straight cut bevels.



Spiral Bevel Gear:

Spiral bevel gears have a helical angle spiral teeth.



Screw Gear (Crossed Helical Gear):

Screw gears are helical gears of opposite helix angle will mesh when their axes are crossed.